LBNL-1023E

ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

Energy Efficiency as a Preferred Resource: Evidence from Utility Resource Plans in the Western United States and Canada

Principal Authors
Nicole Hopper[1], Galen Barbose[1], Charles Goldman[1], Jeff Schlegel[2]

[1] Lawrence Berkeley National Laboratory
[2] Independent Consultant

Energy Analysis Department
Ernest Orlando Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 90R4000
Berkeley CA 94720-8136

Environmental Energy

Technologies Division

September 2008

http://eetd.lbl.gov/ea/EMS/EMS_pubs.html

Pre-print version of article to be published in Energy Efficiency Journal.
"The journal article can be found in the Energy Efficiency Journal at:
http://dx.doi.org/10.1007/s12053-008-9030-x"

The work described in this paper was funded by the Office of Electricity Delivery and Energy Reliability, Permitting, Siting and Analysis of the U.S. Department of Energy under contract No. DE-AC02-05CH11231. The authors are solely responsible for any omissions or errors contained herein.

TABLE OF CONTENTS

TABLES & FIGURES

Title: Energy Efficiency as a Preferred Resource: Evidence from Utility Resource Plans in the Western United States and Canada

Authors: Nicole Hopper[1], Galen Barbose[1], Charles Goldman[1], Jeff Schlegel[2]

Affiliations: [1]Lawrence Berkeley National Laboratory; [2]Independent consultant

Address for correspondence: Charles Goldman, Lawrence Berkeley National Laboratory, 1 Cyclotron Road, MS 90-4000, Berkeley CA 94720, U.S.A.; tel: +1-510-486-4637; fax: +1-510-486-6996; cagoldman@lbl.gov

Abstract

This article examines the future role of energy efficiency as a resource in the Western United States and Canada, as envisioned in the most recent resource plans issued by 16 utilities, representing about 60% of the region's load. Utility and third-party administered energy efficiency programs proposed by 15 utilities over a ten-year horizon would save almost 19,000 GWh annually, about 5.2% of forecast load. There are clear regional trends in the aggressiveness of proposed energy savings. California's investor-owned utilities (IOUs) had the most aggressive savings targets, followed by IOUs in the Pacific Northwest, and the lowest savings were proposed by utilities in Inland West states and by two public utilities on the West coast. The adoption of multiple, aggressive policies targeting energy efficiency and climate change appear to produce sizeable energy efficiency commitments. Certain specific policies, such as mandated energy savings goals for California's IOUs and energy efficiency provisions in Nevada's Renewable Portfolio Standard had a direct impact on the level of energy savings included in the resource plans. Other policies, such as revenue decoupling and shareholder incentives, and voluntary or legislatively mandated greenhouse gas emission reduction policies, may have also impacted utilities' energy efficiency commitments, though the effects of these policies are not easily measured. Despite progress among the utilities in our sample, more aggressive energy efficiency strategies that include high-efficiency standards for additional appliances and equipment, tighter building codes for new construction and renovation, as well as more comprehensive ratepayer-funded energy efficiency programs are likely to be necessary to achieve a region-wide goal of meeting 20% of electricity demand with efficiency in 2020.

Key words

climate change, electric utilities, energy efficiency, energy savings targets, resource planning

1. Introduction

Throughout North America, energy efficiency is generating unprecedented interest, and policymakers are exploring options for prioritizing efficiency in resource investment decisions. Several factors are driving this trend, including: the perception that energy efficiency is a relatively low-cost, environmentally benign resource; rapidly escalating capital costs of new generation resources; difficulties siting new power plants and major transmission facilities; significant increases in fuel costs for natural gas-fired generation plants; and the prospect of future greenhouse gas (GHG) emission regulations.

Electricity market structures vary by state and province in North America, with corresponding differences in the approaches to funding investments in energy efficiency. Most states in the northeast and mid-Atlantic regions of the United States (U.S.) and some Eastern Canadian provinces have restructured electricity markets, consisting of competitive retail suppliers and organized wholesale markets operated by Independent System Operators (ISOs) or Regional Transmission Organizations (RTOs). Public benefit charges are a primary mechanism for supporting energy efficiency in these states, whereby a non-bypassable charge is levied on ratepayers to fund energy efficiency programs administered by utilities or other entities. In addition, ISOs/RTOs have increasingly focused on designing wholesale markets that enable participation by demand-side resources, and two ISOs/RTOs (ISO-New England and PJM) have recently developed capacity markets in which energy efficiency resources are allowed to compete head-to-head with generation to meet long-term capacity requirements.

In the Western U.S. and Canada, organized wholesale markets are the exception rather than the rule: only California and Alberta have ISOs. In most of the West, investor-owned utilities are vertically integrated and subject to rate-of-return regulation, and public utilities and power authorities play a large role. In recent years, the West has seen a renewed emphasis on long-term resource planning by electric (and gas) utilities, partly in response to the Western energy crisis of 2000-01 and concomitant price shocks.[1] Other drivers for the resurgent interest in long-term resource planning include high electricity demand growth, resource adequacy concerns, rapid increases in natural gas prices, and environmental concerns.

Long-term resource planning provides a framework to guide utility resource acquisition decisions and a benchmark for regulators tasked with ensuring the prudence of these decisions. Utilities that engage in resource planning typically repeat the exercise periodically, issuing a new plan every 2–5 years. Although specific practices differ, resource plans typically include several common elements: utilities forecast future loads (typically over a 10-to-20 year time horizon), assess their expected load and resource balance, evaluate a set of candidate resource portfolios to meet projected shortfalls, analyze resource and price uncertainty and the relative risk of alternative resource strategies, and select a “preferred” portfolio based on the results of their analysis. Though the preferred portfolio typically extends over a 10-to-20 year period, utility resource plans often also contain a shorter-term (e.g., 3–5 year) action plan to initiate procurement of resources in line with the preferred portfolio. Typically, the utility’s public utility commission (PUC) or other regulating body will review the utility’s resource plan, often providing an opportunity for public comment. In some cases, regulators may “approve” the particular resources proposed by utilities in their resource plan, though generally the regulatory review is limited to simply determining whether the plan meets established standards regarding content, structure, and methodology.

Long-term resource planning can facilitate utility investments in energy efficiency, by providing a relatively transparent framework within which utilities, state regulators, and other

[1] Most Western states had adopted Integrated Resource Planning (IRP) rules during the 1980s to encourage, and in some cases require, utilities to include demand-side as well as supply-side resources in their resource planning, and to ensure that least-cost resources were chosen. With electric industry restructuring in the 1990s, a number of states and utilities in the West (e.g. Nevada, Arizona, Montana, Colorado, California) consciously de-emphasized long-term resource planning.

stakeholders can compare the relative cost-effectiveness and environmental impacts of supply- and demand-side resources. In addition, Western states and provinces have adopted a wide range of additional policies that directly or indirectly promote energy efficiency, such as: efficiency standards for appliances, equipment and new construction; tax credits; and policies to promote performance contracting in public institutional facilities.

This article examines the future role of energy efficiency as a resource in the Western U.S. and Canada, as envisioned in the most recent resource plans issued by 16 of the region's electric utilities. We compare the projected savings from ratepayer-funded energy efficiency programs included within the preferred resource portfolios proposed in utilities' plans, and we attempt to link these results to state/provincial energy efficiency and climate change policies and other potential drivers of energy efficiency. In many cases, utility resource plans represent the only publicly available source of information on projected levels of utility-sponsored energy efficiency over periods greater than 2–5 years.[2] We demonstrate how this information can be used for region-wide assessments, using the energy efficiency resource acquisitions proposed in the 16 reviewed resource plans as a starting point to track progress toward the goal, adopted by the Western Governors' Association (WGA), of reducing energy use throughout the Western U.S. by 20% in 2020.

2. Data Sources and Assumptions

For this study, we reviewed the most recent publicly available utility resource plans in the Western U.S. and Canada. The utilities are listed in Table 1. We divided them among three regions with distinct climactic, resource-mix, and planning characteristics: California, the Pacific Northwest, and the Inland West. We include BC Hydro in the Pacific Northwest group because it shares a similar climate and hydroelectric-based electric system with this region. Most of the utilities are investor-owned, with the following exceptions: the Los Angeles Department of Water and Power (LADWP) and Seattle City Light are public municipal utilities; Tri-state is a generation and transmission cooperative; and BC Hydro is a provincial Crown corporation. The utilities in Table 1 represent about 62% of the load in the Western Interconnection overseen by the Western Electricity Coordinating Council (WECC, 2005).[3]

To compare utilities' projected levels of energy efficiency savings, we developed several metrics that involve scaling energy efficiency savings to utility retail sales. Although most of the utilities evaluated a range of possible resource portfolios, we used data from each utility's "preferred" or "adopted" portfolio for this study. Similarly, where utilities reported more than one load forecast, we used the "base case" or "most likely" scenario. Several utilities did not report load forecast data for all years of their resource plans. Where necessary, we interpolated or extrapolated missing load forecast data using growth rate trends calculated from the data that were provided.

[2] Utilities also file energy efficiency program plans in which they seek regulatory approval to implement specific programs over periods of typically one to three years.
[3] The WECC control area roughly includes the states of Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming, and the Canadian provinces of British Columbia and Alberta, although it is not precisely bounded by state lines, and it also extends into Mexico.

Table 1. Utility Resource Plans Included in this Study

Utility	Primary Location	Year of resource plan	Timeframe of resource plan
CALIFORNIA			
Los Angeles Department of Water & Power (LADWP)	California	2006	2006-2025
Pacific Gas & Electric (PG&E)	California	2006	2007-2016
Southern California Edison (SCE)	California	2006	2007-2016
San Diego Gas & Electric (SDG&E)	California	2006	2007-2016
PACIFIC NORTHWEST[1]			
Avista	Idaho, Washington	2007	2008-2027
BC Hydro[1]	British Columbia	2006	2006-2025
Portland General Electric (PGE)	Oregon	2007	2008-2012
Puget Sound Energy (PSE)	Washington	2007	2008-2027
Seattle City Light	Washington	2006	2007-2026
INLAND WEST			
Idaho Power	Idaho	2006	2006-2025
Nevada Power	Nevada	2006	2007-2026
NorthWestern Energy	Montana	2007	2008-2027
PacifiCorp[2]	Oregon, Idaho, Utah, California, Washington, Wyoming	2007	2007-2016
Public Service of Colorado/Xcel Energy (PSCo)	Colorado	2007	2008-2020
Sierra Pacific	Nevada	2007	2008-2027
Tri-State Generation & Transmission Association	Colorado, New Mexico, Wyoming, Nebraska	2007	2007-2025

[1]We include the Canadian province of British Columbia in the Pacific Northwest region as it shares a similar climate and a hydroelectric-based electric system.
[2]PacifiCorp's service territory includes both Pacific Northwest and Inland West states, as well as California. We classify it as an Inland West utility because its most (>60%) of its retail sales are in this region.

Given that the resource plans' start-dates and timeframes vary (see Table 1), we calculated and report most of the results in this paper using data for the first five years and the first ten years of each plan. The exception is in section 5, where we examined projected energy efficiency savings over the period from 2006 to 2020, in order to compare the utilities' aggregate energy efficiency projections to the WGA's West-wide energy efficiency goal. To conduct this analysis, we made two assumptions. First, for utilities' whose resource plans did not include energy efficiency proposals through 2020, we assumed their programs would continue to produce incremental annual savings at same level as the last year provided in the plan until 2020. Second, for utilities whose plan start-dates were later than 2006, we used data on energy efficiency proposals obtained from previous resource plans to fill in the early years.

3. Energy efficiency proposed in the resource plans

All of the resource plans included future ratepayer-funded energy efficiency programs in their preferred portfolios. Figure 1 compares the size of these resources, expressed as Gigawatt-hours (GWh) of annual energy savings from programs proposed for implementation during the first five and ten years of each utility's resource plan.[4] The five-year results represent a mid-term horizon, reflecting existing energy efficiency programs that the utility plans to continue, as well

[4] These projections reflect savings only from programs implemented over each utility's planning period, and exclude savings that persist from programs implemented in prior years.

as new or expanded programs that are under development and are likely to be authorized by regulators. The ten-year horizon reflects a longer-term, somewhat more speculative outlook as utility energy efficiency program funding is not typically authorized for more than two or three years at a time.[5]

The combined five-year targets of the 16 utilities add to over 9,500 GWh of annual savings. After ten years, the 15 utilities (omitting Portland Gas and Electric (PGE), whose plan did not extend to ten years) propose almost 19,000 GWh of combined annual savings. The highest targets are for Pacific Gas & Electric (PG&E), Southern California Edison (SCE), BC Hydro, and PacifiCorp, in part reflecting the fact that these are, by far, the largest utilities in our sample. Virtually all of the utilities have signficantly expanded their energy efficiency proposals compared to previous plans, which were reported by Hopper et al. (2006).

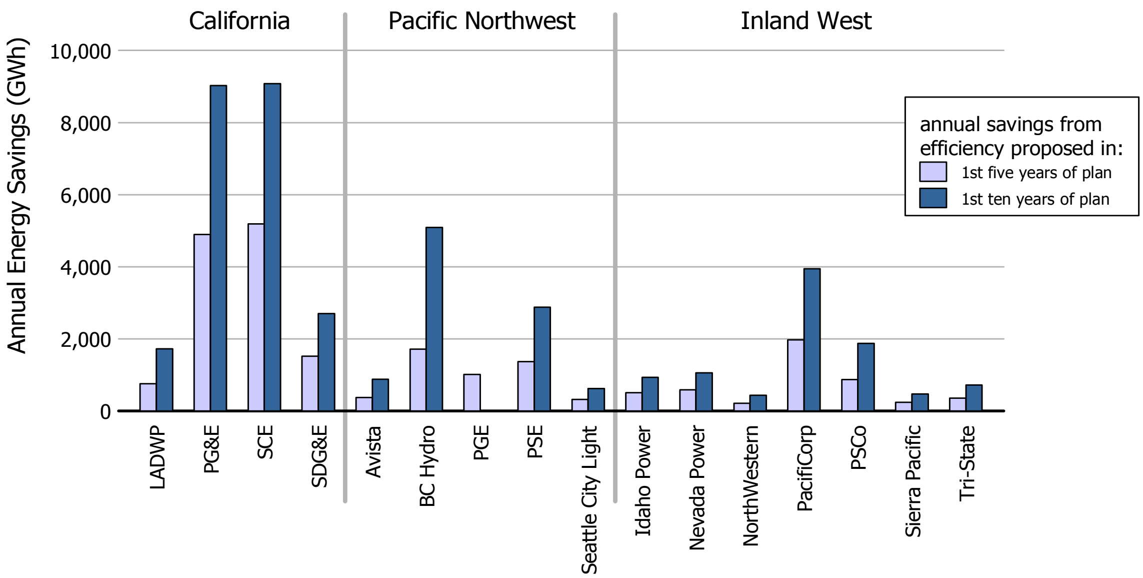

Figure 1. Energy Saving Effects of Proposed Energy Efficiency Programs

We also report utilities' energy efficiency program proposals as proportions of their forecast energy demand and energy demand growth in Table 2. We define energy demand as total energy requirements (TER). TER represents the amount of load that would have to be served with supply-side resources if no energy efficiency strategies were implemented during the forecast period.[6]

The first metric in Table 2—energy savings as a percentage of forecast load—reveals the share of TER proposed to be met with energy efficiency, and normalizes the energy efficiency proposals for the size of the utility. In aggregate, the 16 utilities propose to meet about 3% of

---

[5] Only about half of the resource plans forecast farther than ten years into the future, limiting our ability to report data across utilities over longer planning horizons (e.g. 20 years), which would be more useful for fully assessing the impact of carbon policies and various mitigation strategies.

[6] In practice, most of the utilities in our sample did not elaborate on their treatment of efficiency in their load forecasts, and it is unclear to what degree past and future energy savings from naturally occurring efficiency, standards and codes are accounted for in the reported load forecasts. In the absence of such clarification, we made the assumption that the forecasts as given represent TER, but we acknowledge that this may introduce bias to the results in Table 2.

their combined load with efficiency after five years, and 5% after ten years (the latter figure does not include PGE, for which ten-year data are not available).

Table 2. Energy Savings Metrics

Utility	First Five Years of Plan		First Ten Years of Plan	
	Energy savings (% of 5th-year TER[1])	**Energy savings (% of growth in TER[1] over 1st five years)**	**Energy savings (% of 10th year TER[1])**	**Energy savings (% of growth in TER[1] over 1st ten years)**
CALIFORNIA				
LADWP	2.7%	36%	5.7%	46%
PG&E	5.4%	84%	9.3%	73%
SCE	5.4%	50%	8.5%	44%
SDG&E	7.3%	56%	11.4%	50%
PACIFIC NORTHWEST				
Avista	3.4%	22%	7.1%	30%
BC Hydro	2.8%	32%	7.7%	53%
PGE	4.3%	40%	—	—
PSE	5.8%	77%	11.1%	71%
Seattle City Light	3.0%	52%	5.5%	49%
INLAND WEST				
Idaho Power	3.1%	34%	5.1%	31%
Nevada Power	2.3%	14%	3.7%	16%
NorthWestern	3.2%	52%	6.1%	50%
PacifiCorp	3.0%	19%	5.3%	22%
PSCo	2.9%	32%	5.7%	32%
Sierra Pacific	2.5%	23%	4.3%	24%
Tri-State	1.9%	8%	3.6%	12%
Load-weighted Average	**2.9%**	**26%**	**5.2%**	**31%**

[1]TER(Total Energy Requirements) = forecasted energy demand, not accounting for the effects of energy efficiency programs proposed for implementation over the planning period.

There are clear differences among regions, with the largest resource contributions proposed by the California investor-owned utilities (8.5% to over 11% of forecast load after ten years). Puget Sound Electric (PSE) is also in this range, planning to meet over 11% of its load with energy efficiency after ten years. Most of the other Pacific Northwest utilities have more moderate ten-year proposals at just over 7% of load. The least aggressive proposals are among the Inland West utilities, in the 4–6% range. The two coastal municipal utilities, Seattle City Light and LADWP, proposed efficiency resources similar to the Inland West utilities.

The second metric in Table 2—energy savings as a percentage of forecast load growth—demonstrates the degree to which utilities are planning to meet expected demand growth with efficiency. In aggregate, the 16 utilities are proposing to meet about 26% of their combined demand growth over the first five years of their plans with energy efficiency, and 31% after ten years. Savings from individual utilities' proposed efficiency activities range from 12% to over 70% of load growth after ten years.

Load growth is a significant issue for utilities in Western North America, and energy efficiency is often viewed through the lens of growth mitigation. We compare the utilities' forecast average annual load growth, with and without their proposed energy efficiency activities, over the first ten years of their plans in Figure 2. In California, energy efficiency is expected to reduce load growth by over 70% for PG&E, and 40- 50% for the other utilities. In the Pacific Northwest, energy savings can be expected to reduce average annual load growth by 70% for PSE, by about half for BC Hydro and Seattle City Light, and by roughly one quarter for Avista. Among the Inland West utilities, the impact on load growth rates is more modest, with reductions of up to one third.

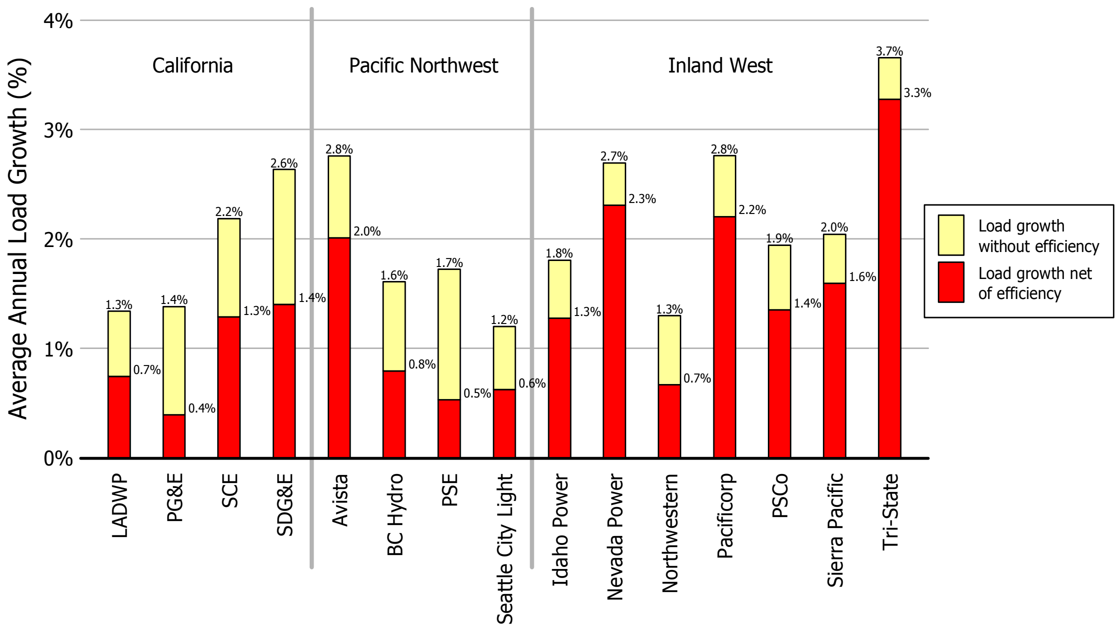

Figure 2. Impact of Energy Efficiency Programs on Forecast Energy Load Growth: Ten-Year Timeframe

4. Policy and market drivers of energy efficiency

What explains the differences in proposed levels of energy efficiency among the utilities in this study? Clearly there are regional trends: California leads with the most aggressive proposals, followed by the Pacific Northwest, and the lowest savings levels are observed among the Inland West utilities. Utility ownership structure also appears to be impactful: the major exception to the geographic trend is the coastal municipal utilities—LADWP and Seattle City Light—whose proposals resemble the Inland West utilities'; and the lowest targets among all the plans were proposed by Tri-State, a wholesale cooperative. Utility experience administering and implementing energy efficiency programs and/or the maturity of the programs themselves may also affect the extent to which senior utility managers are comfortable proposing future aggressive energy efficiency goals.[7]

We postulate that a number of policies and other market drivers underlie these trends. Despite the absence of a federal climate policy in the U.S., there is growing activity at the state and regional level to establish policies to promote energy efficiency as a high priority resource,

[7] For example, in Nevada, utilities effectively stopped offering energy efficiency programs during the mid-1990s and many of their energy efficiency staff were re-assigned or moved on. These utilities are in the process of ramping up new programs and have to rebuild their portfolios and train new energy efficiency program staff.

and to mitigate greenhouse gas emissions. Some of these policies are all-encompassing, and others apply only to investor-owned—not municipal or cooperative—utilities.

In Table 3, we rank the utilities in our study in terms of the aggressiveness of their proposed energy efficiency activities, and we indicate the various types of state/provincial policies to encourage energy efficiency or climate change mitigation, as well as other market drivers, to which they are subject. In terms of simple numbers of policies and drivers, the California investor-owned utilities stand out—PG&E, SCE and SDG&E's proposed energy efficiency activities are among the top four most aggressive, and these utilities are subject to the most factors in Table 3, reflecting an aggressive policy initiative in California to make energy efficiency the highest priority resource. But this example aside, the number of policies and drivers in Table 3 does not have an obvious link to the amount of energy efficiency proposed in the resource plans. For example, only one factor applies to Northwestern, yet it is ranked in the middle third of utilities, while several utilities in the bottom third have 3 or 4 factors.

Obviously, it would be difficult, if not impossible, to disentangle the impact of all the policies and market drivers on utility preference for energy efficiency in their resource plans. We will not attempt to do so. Instead, we discuss each in turn, providing where appropriate specific examples of how a given policy or driver impacted the level of energy efficiency considered or proposed in utility resource plans.

Table 3. Drivers of Energy Efficiency among Utilities in the West

	SDG&E	PSE	PG&E	SCE	BC Hydro	PGE[1]	Avista[2]	North-Western	LADWP[3]	PSCo	Seattle City Light	PacifiCorp[2]	Idaho Power[2]	Sierra Pacific	Nevada Power	Tri-State[2]
Savings from proposed energy efficiency programs after 1st ten years of plan (% of forecast load)	11.4	11.1	9.3	8.5	7.7	7.5	7.1	6.1	5.7	5.7	5.5	5.3	5.1	4.3	3.7	3.6
Energy efficiency policies																
Mandate to pursue all cost-effective energy efficiency	X	X	X	X			X (WA)				X					
EEPS or RPS with energy efficiency set-aside[4]										X				X	X	
Revenue decoupling	X		X	X									X			
Shareholder incentives	X	X	X	X				X		X			X	X	X	
Climate change policies																
State/province-wide carbon emission reduction goals	X	X	X	X	X	X	X (WA)		X	X	X	X				X (CO, NM)
Generation carbon emission performance standards	X	X	X	X	X		X (WA)		X		X	X (WA, CA)				
Carbon emission mitigation requirements		X				X	X (WA)				X	X (WA, OR)				
GHG emission cost adder	X	X	X	X			X			X		X	X			
Other market drivers																
High forecast load growth (>2%/year)	X			X		X	X					X			X	X
High retail electric rates (>20% above the U.S. national average)[5]	X		X	X										X		

[1]PGE only proposed energy efficiency programs for five years; the value shown was calculated assuming the programs would continue for an additional five years at the same level as the last year proposed.

[2]Where specified, drivers apply only for the portion of the utility's service territory in the states indicated.
[3]LADWP, a public municipal utility, was not subject to California's energy-efficiency mandate at the time its resource plan was issued. Going forward, a similar law will apply to municipal utilities.
[4]EEPS=Energy Efficiency Portfolio Standard; RPS=Renewable Portfolio Standard
[5]Source: United States Energy Information Administration, Form-861 (2006).

4.1 Energy efficiency policies

A number of jurisdictions in the West have implemented policies designed to directly encourage or mandate utility investment in energy efficiency, which are discussed below.

4.1.1 Mandates to pursue cost-effective energy efficiency

The states of California and Washington have adopted mandates requiring their investor-owned utilities to identify and pursue all achievable cost-effective energy efficiency before considering investment in new generation options.[8]

California's mandate takes the form of a "loading order" policy, codified by statute, requiring the state's utilities' procurement plans to "include a showing that the electrical corporation will first meet its unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible" (SB 1037, 2005). The loading order policy puts energy efficiency first because it is believed to be the lowest-cost, environmentally preferred resource.

To implement this policy, the California Public Utilities Commission (CPUC) adopted long-term energy efficiency goals for the state's investor-owned utilities (CPUC, 2004), drawing in part from the results of a study that estimated the achievable cost-effective energy efficiency potential in the three utilities' service territories (Rufo and Coito, 2002). This policy had a direct impact on the amount of energy efficiency proposed in PG&E, SCE and SDG&E's resource plans, and their proposals closely match the CPUC goals. While several additional supporting policies and factors are in place to encourage and eliminate barriers to California's investor-owned utilities pursuing energy efficiency, it was the annual energy savings goals set forth by the CPUC, and the underlying statutory mandate for utilities to acquire all achievable cost-effective energy efficiency, that drove the specific levels of energy efficiency proposed in these utilities' resource plans.

In Washington, voters passed a ballot initiative in 2006 requiring the state's large utilities to "pursue all available conservation that is cost-effective, reliable, and feasible" (VI 937, 2006, Sec. 4). Accordingly, each of the Washington utilities—PSE, Avista, and Seattle City Light—developed energy efficiency savings targets for their resource plans based on their current estimates of the maximum achievable energy efficiency potential in their service territories.

4.1.2 Energy efficiency portfolio standards and renewable portfolio standards with efficiency set-asides

Two states in the western U.S. have enacted portfolio standards, either specifically for energy efficiency or for a broader class of resources that includes energy efficiency.

Colorado has an energy efficiency portfolio standard (EEPS) requiring Public Service of Colorado (PSCo) to achieve energy savings equivalent to 5% of its 2006 retail sales and peak demand by 2018 (HB 07-1037, 2007, Sec. 40-3.2-104(2)). PSCo developed the proposed energy

[8] Washington's mandate applies to both investor-owned and public utilities with more than 25,000 customers.

efficiency activity in its resource plan based on its estimation of the full achievable potential in its service territory, which turned out to be greater than the EEPS requirement. In this case, the state policy effectively set a floor on energy efficiency investment. Carbon emission reduction goals in Colorado (discussed below) appear to have played a more direct role in determining the level of energy efficiency proposed by PSCo.

Nevada has a renewable portfolio standard (RPS), which requires utilities to meet 20% of their energy requirements with renewable energy sources by 2015, but allows them to meet up to 25% of this target with energy efficiency (Nevada AB 3, 2005, Sec. 29). Based on their assessment that this portion of their RPS target can be met more cost-effectively with energy efficiency programs than with renewable energy projects, the Nevada utilities included energy efficiency targets in their resource plans equal to the maximum amount of efficiency allowed for RPS compliance. As neither Nevada Power nor Sierra Pacific attempted to evaluate whether additional energy efficiency would be cost-effective, the RPS appears to be effectively driving proposed investment levels in energy efficiency programs in Nevada. Thus, unlike PSCo, the Nevada utilities appear to treat their portfolio standard as a cap, rather than a floor, on the amount of energy efficiency they pursue.

4.1.3 Strategies to overcome utility financial disincentives to energy efficiency: revenue decoupling and shareholder incentive mechanisms

Utility spending on energy efficiency can affect the utility's financial position: (1) through the impact on utility earnings of reduced sales; and (2) through the effects on shareholder value of energy efficiency spending versus investment in supply-side resources (Jensen, 2007). In the first case, energy efficiency directly reduces utility revenues by decreasing electric sales. The impact on shareholder value is linked to how rates are typically set. Utilities incur both fixed costs, which do not vary as a function of short-run changes in sales, and variable costs, which do. In most states, regulators direct utilities to recover a portion of their fixed costs, which include a return on capital, through volumetric rates (i.e., $/kWh usage charges). If the utility effectively implements energy efficiency programs and actual sales are lower than forecast when prices were set, the utility will under-recover its fixed costs.

Revenue decoupling is one method to address utility disincentives to pursue energy efficiency. Decoupling separates revenue and profits from the volume of electricity sales, and conceptually should make the utility indifferent to sales fluctuations. In practice, decoupling involves setting revenue targets that are independent of sales, and then truing up retail rates periodically to meet them in the face of any fluctuations. As a result, the utility's revenues between rate cases are not affected by reduced sales resulting from energy efficiency programs (or, depending on the design of the decoupling mechanism, other factors such as weather or economic growth). Among the jurisdictions in our study, the states of California and Idaho have adopted decoupling mechanisms for their electric utilities.

Although revenue decoupling can remove utilities' short-term financial disincentives to pursuing energy efficiency, it does not provide a positive financial incentive to invest in efficiency. Utility shareholders stand to gain more from constructing new generating capacity—physical assets on which they earn a rate of return—than from less tangible "negawatts" for which they receive cost recovery as an expense item, but no additional earnings. To address this issue, a number of jurisdictions have adopted strategies that allow utilities the opportunity to earn financial incentives for exemplary performance in cost-effectively delivering energy efficiency resources. The policy goal is to align utility financial interests with the regulator's established goals for successful delivery of energy efficiency. These incentive mechanisms can take a variety of forms, including: capitalizing energy efficiency program spending, allowing utilities to earn a rate of return on the "regulatory asset"; shared savings schemes, whereby utilities may keep a portion of the net benefits from energy efficiency programs; and performance bonuses, in which utilities earn financial incentives if they meet established savings targets for their efficiency programs (this may be combined with penalties for falling below an established minimum savings target) (Jensen, 2007).

Several states in the West (California, Washington, Montana, Colorado, Idaho and Nevada) have adopted some form of shareholder incentives to encourage their electric utilities to pursue energy efficiency. In California, shareholder incentives are viewed by the investor-owned utilities as a very important policy driver (along with decoupling) allowing them to make a business case for unprecedentedly large-scale programs (PG&E, 2007; SCE, 2007). Although performance incentives were not adopted in California until after the most recent resource plans were issued (CPUC, 2007), significant ramp-up of the utilities' energy efficiency programs for the 2006-08 period was in part enabled by a CPUC decision indicating it would put in place a shareholder incentive mechanism that would be effective during that period and going forward. Utility energy efficiency program managers in Nevada also assert that performance incentives are an important driver for their management to make energy efficiency a high priority within the company (Sierra Pacific Power, 2007).

4.2 Climate change policies

Some Western states and provinces have also adopted policies driven by concerns regarding the impacts of climate change that may indirectly encourage utilities to consider energy efficiency (see Table 3).[9]

4.2.1 Carbon emission reduction goals

California, Colorado, Oregon, Washington, New Mexico, Arizona, Utah, British Columbia, and Alberta have adopted state- or province-wide carbon emission reduction goals, either by executive order or statute. All of the above jurisdictions except Colorado and Alberta are also signatories to the Western Carbon Initiative (WCI), which is in the process of developing a region-wide cap-and-trade program, or other market-based mechanism, to help the member states and provinces achieve their individual goals. Since almost all the utilities in our sample are subject to carbon emission reduction goals, it is difficult to draw conclusions about the impact of these policies on proposed energy efficiency savings.[10] Moreover, with the

---

[9] While BC Hydro is technically subject to the limits set by the Kyoto protocol, which was ratified by the Canadian government in 2002, inaction on the part of the federal government has led the country to fall far short of fulfilling its obligations, and has prompted several provinces (e.g., British Columbia, Manitoba, Quebec) to adopt climate action policies of their own. As a result, it is the provincial policies described here, and not the federal Kyoto obligation, that drive climate-change mitigation activities in British Columbia.

[10] The levels of efficiency in the Oregon utilities' resources plans are restricted by the SB1149 legislation which was in effect when they were completed. SB1149 fixed energy efficiency funding at the level implemented by the Oregon Energy Trust, and did not permit utilities to spend more. The Oregon Energy Trust was responsible for forecasting savings and reporting them to the utilities for inclusion in their resource plans . As a result, it is doubtful that the state's carbon emission reduction goals had much bearing on the levels of energy efficiency included in the resource plans in our study. In 2007, new legislation (SB838) was passed, allowing the utilities to increase funding, so this restriction will not be binding in future resource plans.

exception of California, none of the states or provinces has created the regulatory authority to enforce them.

4.2.2 Generation carbon emission performance standards

A second GHG-mitigation policy that has been adopted by California, Washington and British Columbia is generation carbon emission performance standards. These jurisdictions prohibit their utilities from building new power plants or from signing new long-term contracts with plants that have carbon emission rates greater than a specified level. The U.S. states have set this level at the established emission rate of a new combined-cycle gas turbine. British Columbia's policy goes further, requiring zero GHG emissions from new coal plants. These policies effectively prohibit the construction or contracting of coal plants without carbon capture and sequestration (CCS) technology. By limiting generation options for meeting demand growth, such policies may provide additional impetus for utilities to consider energy efficiency.

4.2.3 Carbon emission mitigation requirements

Oregon and Washington have also adopted a third type of climate change policy. As a condition for receiving approval to construct new power plants, these jurisdictions require that applicants for site permits physically offset a portion of the projected emissions. In both states, applicants have the choice of implementing offset projects themselves or making a payment, based on a specified price per ton of projected carbon emissions, to fund offset projects implemented by a designated entity. By increasing the cost of GHG-emitting new generation, carbon emission mitigation requirements increase the competitiveness of energy efficiency relative to other options.

4.2.4 GHG emission cost adders

The practice of including GHG emission cost adders in utility resource planning and procurement is also gaining popularity. In some states, (e.g., California, Idaho and Colorado), public utility commissions formally direct utilities to use GHG emission cost adders. In some cases, utilities have voluntarily included them in their resource plans (see Table 3). Inclusion of GHG emission cost adders should increase the cost-effectiveness of energy efficiency (and renewable energy) relative to carbon-emitting generation resources in those jurisdictions where they are used.

4.3 Other market drivers

We identified two non-policy drivers that probably impact the level of energy efficiency proposed by utilities in the West: high forecast load growth and high retail electricity rates.

4.3.1 High forecast load growth

A number of utilities in the West, particularly in the Southwest and parts of California, are forecasting significant load growth over the next decade. For such utilities, higher gross levels of energy savings will be required to offset their incremental load growth with energy efficiency. This is demonstrated by the negative correlation between forecast load growth and energy savings proposed in utility resource plans, expressed as a percentage of that load growth (see Figure 3). Although this is largely a mathematical result (the variables plotted in Figure 3 are related), it illustrates that in order to achieve higher *relative* energy savings metrics, utilities with higher load growth need to implement more aggressive efficiency measures.

Nonetheless, high load growth creates significant additional opportunities for energy efficiency, particularly in new construction markets, which should offset the above phenomenon to some degree. Load growth also places pressure on existing electric system infrastructure, potentially leading to incremental capital expenditures in new plant and transmission and distribution facilities, thereby increasing the avoided-capacity value of energy efficiency. These dynamics increase energy efficiency technical potential and cost-effectiveness.

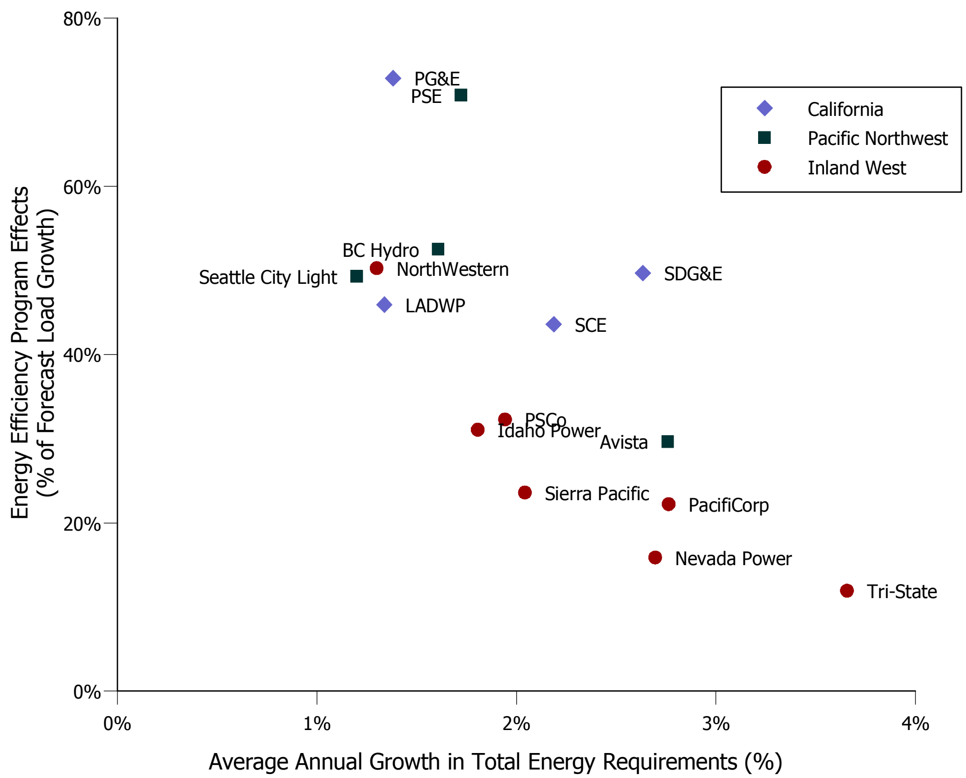

Figure 3. Energy Efficiency Program Effects vs. Forecast Energy Demand Growth

However, the utilities appearing along the bottom-left edge of the curve include the only four among our sample that did not base their proposed energy efficiency targets on estimates of maximum achievable potential: Nevada Power, Sierra Pacific, Tri-State, and Idaho Power. Moreover, SCE and SDG&E forecast load growth rates in the same range, yet their energy efficiency proposals are much higher. This is in part because the Inland West states have historically not been as active in promoting energy efficiency as the coastal regions, and current policies to promote energy efficiency are more limited (see Table 3 and above discussion). With enhanced policy support, the above-mentioned Inland West utilities could probably do more to capture the significant and lasting energy efficiency potential afforded by the fast pace of development in their service territories.

4.3.2 High retail electric rates

Another potential driver is high retail electric rates. High retail energy prices enhance the energy efficiency value proposition from the customer's perspective, and expand overall cost-effective energy efficiency potential. Utilities and policymakers in jurisdictions with higher-than-average electricity rates may also experience more pressure to minimize the impact on electric rates from resource investment decisions. Thus high retail electric rates may act as a driver for energy efficiency both directly (i.e., in utility resource plans) and indirectly (i.e., by driving the adoption of policies to support energy efficiency, such as were described above).

Among the jurisdictions in our sample, Nevada and California stand out as having retail electric rates more than 20% above the national average (see Table 3). Figure 4 plots individual utilities' ten-year energy efficiency metrics against their average retail rates. To some extent, the figure confirms our expectations about the expected relationship between average retail rates and energy efficiency savings levels. In particular, California's three investor-owned utilities have the highest electric rates in our sample, and also have the highest energy efficiency targets. While we have already discussed a number of policies driving this result, high prices in California have undoubtedly contributed to the consensus required to develop such strong support for energy efficiency.

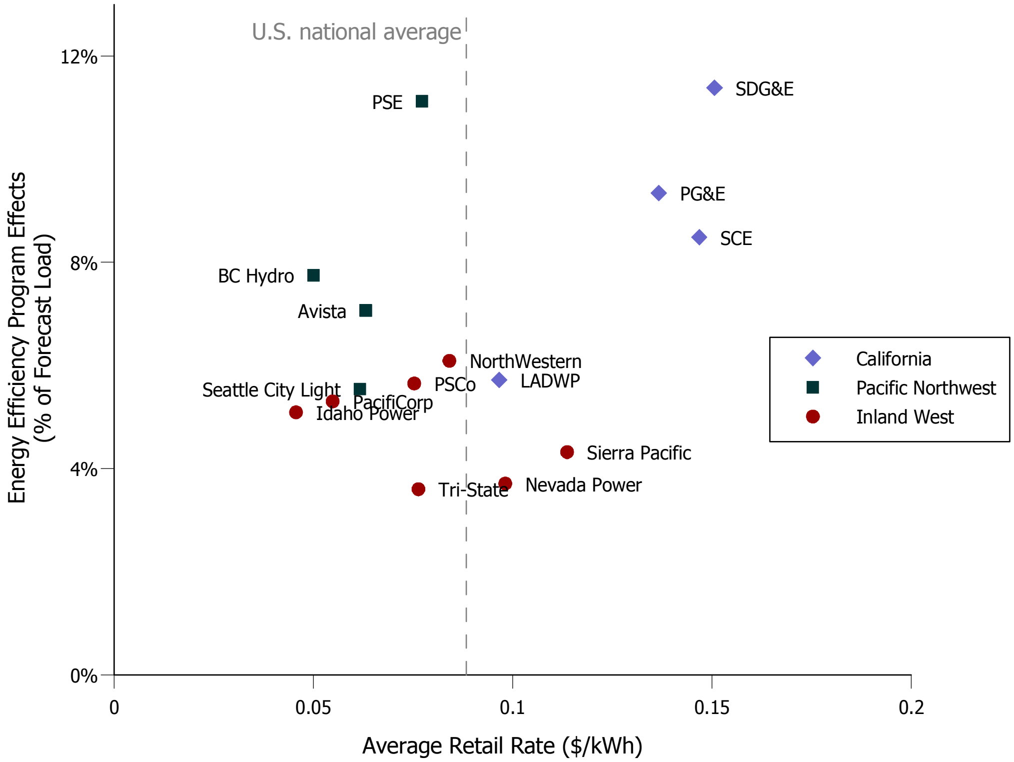

Figure 4. Efficiency Program Effects vs. Average Retail Electricity Prices
Sources: EIA (2006) for U.S. utility price data, BC Hydro (2006) for BC Hydro price data.

However, the expected relationship between average retail rates and energy efficiency savings levels is not borne out for most other utilities. PSE and, to a lesser extent, BC Hydro and Avista's energy efficiency proposals stand out as being extremely aggressive, despite these companies' relatively low retail electricity prices. This demonstrates that energy efficiency can make economic sense in regions with relatively low retail rates, while suggesting that other factors may drive its support. The Pacific Northwest is a somewhat unique case. With its strong dependence on hydropower, its system planners have historically been more concerned about energy rather than capacity constraints. However, the region's hydro capacity is largely developed, and new generation resources (primarily natural gas and renewable plants) have higher capital and, in the case of gas-fired units, higher and more volatile operating costs than the existing fleet of resources. As a result, new generation puts upward pressure on existing retail rates (which are relatively low). This factor, in conjunction with the public's desire to minimize the negative environmental consequences of electricity generation provide important drivers for strong public policy support for energy efficiency in this region.

The bottom line is that, although retail rates can be a driver for energy efficiency, high electricity prices are not necessary to make the business case for efficiency, and in isolation do not make a good predictor of energy efficiency activity.

5. Achieving 20% efficiency gains across the West

In 2004, the Western Governors' Association (WGA), recognizing the need for a coordinated energy policy among its member states, formed the Clean and Diversified Energy Advisory Committee (CDEAC) to investigate clean energy options and develop consensus on a Clean and Diversified Energy initiative (CDEi) for the West. This process resulted in a series of resolutions, including a voluntary goal of improving energy efficiency by 20% by 2020 (WGA, 2004). This goal is premised on West-wide implementation of a set of best practices and strategies covering ratepayer-funded energy efficiency programs, federal and state appliance energy efficiency standards, and energy efficiency provisions in state building codes (WGA CDEAC, 2006). It applies to all the utilities in our study except BC Hydro.

CDEAC's first progress report identified qualitative achievements toward this goal, focusing on policies adopted and programs initiated and funded among the Western states in the first years since the goal was adopted (WGA CDEAC, 2007). However, the report included no quantitative metric of actual progress, citing difficulties in measuring energy efficiency impacts. Utility resource plans, including as they do long-term load and resource data, could be a relatively accessible source of quantitative information to measure intended progress toward the CDEi goal. Although the energy efficiency proposals in the resource plans do not represent concrete commitments, they can serve as a basis to determine how close the proposals would come to meeting the goal, if implemented.

However, the current resource plans provide only partial information to answer this question because they only specify savings from ratepayer-funded energy efficiency programs, and not from state or federal appliance efficiency standards or energy efficiency provisions in state building codes that could count toward the CDEi goal.[11]

Acknowledging these shortcomings, we report the energy efficiency program data that were available in the resource plans as a proportion of TER in 2020, using 2006 as the starting point for counting efficiency measures (see Table 4).[12] This provides insight into the contribution

[11] Moreover, the methods used to account for standards, codes and naturally occurring energy efficiency in utilities' load forecasts are typically not documented in the resource plans, so it is unclear whether the published load forecasts include energy savings from these sources.

[12] Energy efficiency measures implemented prior to 2006 may not be counted toward the CDEi goal; however, energy efficiency policies and programs authorized prior to 2006 but whose measures were implemented in 2006 or later are acceptable.

of ratepayer-funded energy efficiency programs, as currently envisioned by utilities, in meeting the CDEi goal of meeting 20% of energy requirements with energy efficiency by 2020.

The California investor-owned utilities (PG&E, SCE and SDG&E), along with PGE and PSE in the Pacific Northwest, are poised to achieve more than half of the WGA goal (i.e., at least 10% reduction in energy use) in their service territories if they implement the energy efficiency programs proposed in their resource plans. BC Hydro would also be in this category, even though as a Canadian utility it is not subject to the CDEi goal.

The remaining coastal utilities (LADWP, Avista and Seattle City Light), along with Northwestern, PacifiCorp and PSCo, are expected to meet between 7% and 10% of energy requirements if they implement all the efficiency in their resource plans. The utilities in Idaho and Nevada, along with Tri-state, can be expected to meet less than 6% of energy requirements with the level of savings from energy-efficiency programs included in their current resource plans.

Table 4. Utilities' Progress toward the WGA CDEi Energy Efficiency Goal

Utility	Savings from proposed energy efficiency programs in 2020 (% of TER[1])
CALIFORNIA	
LADWP[2]	8.4%
PG&E[2]	12.9%
SCE[2]	11.0%
SDG&E[2]	15.3%
PACIFIC NORTHWEST	
Avista	7.9%
BC Hydro	11.3%
PGE[2]	10.0%
PSE	13.7%
Seattle City Light	8.3%
INLAND WEST	
Idaho Power	5.6%
Nevada Power	3.9%
Northwestern	8.8%
PacifiCorp	7.1%
PSCo[2]	7.6%
Sierra Pacific	5.6%
Tri-State	4.8%

[1]TER (Total Energy Requirements) = forecasted energy demand, not accounting for the effects of energy efficiency programs proposed for implementation over the planning period.
[2]The resource plan did not propose savings to 2020; the reported value was calculated assuming energy efficiency programs would continue at same level as the last year for which energy efficiency programs were proposed in the resource plan.

Ultimately, the ability of each state to meet the CDEi goal depends both on the contribution from energy efficiency programs, as well as the scope and enforcement of appliance and equipment standards and building codes. The Northwest Power and Conservation Council (NPCC) tracks and reports the relative contributions of energy efficiency programs, codes and standards across the Pacific Northwest states. This analysis of historical energy efficiency measures provides an indication of the relative contributions of each of these energy efficiency strategies in the Northwest (see Figure 5). As of 2006, energy efficiency programs administered by the region's utilities, Bonneville Power Administration (a federal electricity wholesaler), and the Northwest Energy Efficiency Alliance accounted for 60% of regional energy efficiency resources. State codes and federal appliance efficiency standards each provided 20% of regional savings.

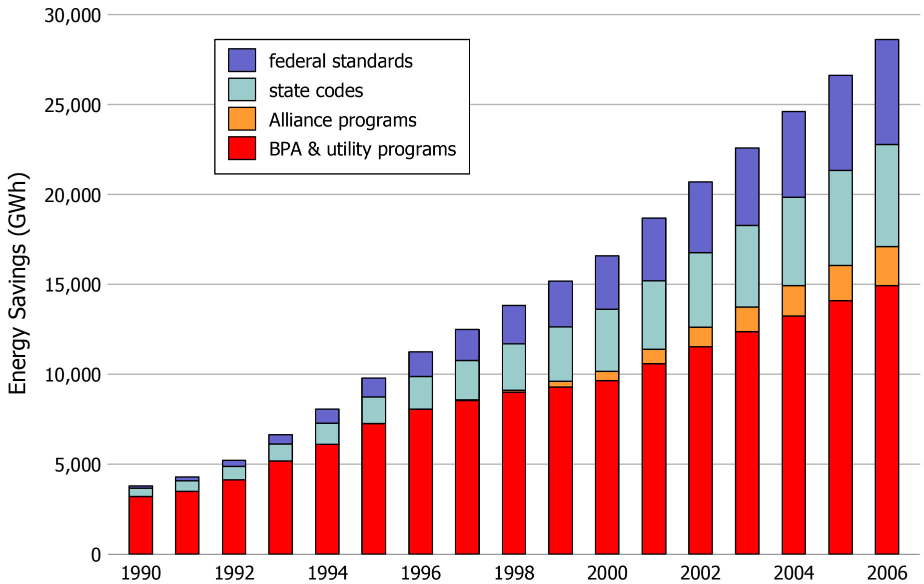

Figure 5. Energy Efficiency Resources in the Pacific Northwest: 1990–2006
Source: NPCC (2008)

Going forward, federal standards adopted in the recent Energy Independence and Security Act (EISA) will likely increase the relative contribution of and savings from federal energy efficiency standards for appliances and equipment.[13] The relative role of and savings from state building codes and standards in other parts of the West depends primarily on the amount of new construction, the efficiency levels embedded in building codes or standards, and the extent to which builders actually comply with the energy efficiency standards in new construction. Nonetheless the Pacific Northwest example (Figure 5) suggests that if at least 60% of the WGA goal (i.e., 12%, should be achieved by utility programs), then the coastal IOUs are mostly on track but the inland utilities and LADWP fall short.[14]

Many parts of the West lack a regional agency such as the NPCC or a state energy office with the analytical capabilities to track the effects of standards and codes. Given this reality, a more complete picture of energy efficiency resource shares across the West going forward would be possible if utilities in such jurisdictions adopted the practice of accounting for standards and codes explicitly in their resource plans.[15] Hopper et al. (2006) provide concrete recommendations to assist utilities to do so.

[13] The new law introduces energy efficiency standards for twelve types of appliances and equipment, and also mandates significant improvements in incandescent lighting (common light bulbs are to use 20% less energy than current incandescent bulbs by 2012, and 30% less by 2014).
[14] Savings of 12% from energy efficiency programs should be sufficient to meet the WGA goal where there is strong support for codes and standards. In areas (such as the Inland West) with less contribution from these other sources, utility energy efficiency programs may need to make up a larger portion of savings to meet the WGA goal.
[15] Utilities typically account for the effects of standards and codes in their load forecasts through some combination of end-use and econometric analysis techniques. Reporting these assumed savings levels in their resource plan documents would represent relatively little incremental effort on the utilities' part while providing useful information to state agencies and regulators, and the public.

6. Conclusions

This survey of recent utility resource plans reveals a significant and growing commitment to energy efficiency as a resource in the West, even in states that have placed less emphasis on ratepayer-funded energy efficiency in recent years (e.g., Nevada, Colorado, Idaho, Montana). This is occurring despite the absence of federal climate change leadership, as states and provinces are stepping up with their own policies in support of energy efficiency and GHG emission mitigation.

Utility resource planning provides a framework and a forum for evaluating energy efficiency resource potential and for helping ensure that it is given appropriate priority in resource acquisition decisions. The process of resource planning is spreading—a number of states have recently passed or updated state statutes or regulatory decisions that require utilities to prepare and file integrated resource plans, both in the West (e.g., New Mexico, Wyoming) and the Mid-West (e.g., Missouri).

However, resource planning in itself is not sufficient to ensure that socially optimal levels of energy efficiency resources will be pursued by utilities. This study has demonstrated that, among utilities currently performing resource planning, commitments to energy efficiency vary considerably, with the most aggressive plans in California and parts of the Pacific Northwest, and less aggressive proposals in the Inland West, where utilities and policymakers have had less experience implementing ratepayer-funded energy efficiency programs in recent years.

Although it is difficult to disentangle the impacts of the numerous policy instruments and market drivers on the proposed levels of energy efficiency, a few trends do emerge. The adoption of multiple, aggressive policies targeting energy efficiency and climate change does appear to produce sizeable energy efficiency commitments (e.g., the California investor-owned utilities, PSE, Avista, PSCo). In some cases, setting specific targets—such as the CPUC's mandated goals for investor-owned utilities and Nevada's RPS provisions—dictate directly the amount of energy savings included in utilities' portfolios. Other policies, such as revenue decoupling and shareholder incentives, may be a necessary prerequisite for developing support for energy efficiency among utility managers and shareholders. And GHG emission reduction policies may also have an impact—albeit not easily measured—by enhancing the cost-effectiveness of energy efficiency relative to other resource options, or more generally signaling the high priority attached to environmental impacts.

Despite the progress made by the utilities in our sample, our analysis suggests that much work needs to be done to achieve the WGA CDEi goal of meeting 20% of electricity demand with efficiency in 2020. New federal appliance efficiency standards will help, but individual states will still need to significantly enhance their efforts to encourage additional utility program investment, and adopt and enforce state appliance standards and energy efficiency provisions in building codes along current best practices. For the Inland West states, high load growth affords significant, lasting energy savings opportunities that can help them meet this goal, but action is needed to capture these one-time opportunities before they are lost.

Going forward, we expect to see continued growth in the importance of energy efficiency in the West, as demand continues to grow, environmental concerns mount, and constraints on supply-side options continue to bind. The adoption of a federal climate change policy, if sufficiently aggressive, could also provide further impetus for energy efficiency investment.

Acknowledgements

The work described in this report was funded by the Permitting, Siting and Analysis Division of the Office of Electricity Delivery and Energy Reliability of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

References

BC Hydro (2006). BC Hydro 2005 Annual Report. Retrieved March 14, 2008 from: http://www.bchydro.com/info/reports/2005annualreport/report39515.html

California Public Utilities Commission (CPUC) (2004). Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond. CPUC Decision 04-09-060. September 23. Retrieved March 13, 2008 from: http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/40212.htm

California Public Utilities Commission (CPUC) (2007). Interim Opinion on Phase 1 Issues: Energy Efficiency Shareholder Mechanism, CPUC Decision 07-09-043. September 20.

California Senate Bill 1037 (SB 1037) (2005). September 29. Retrieved March 7, 2008, from: http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_1001-1050/sb_1037_bill_20050929_chaptered.pdf

Colorado House Bill 07-1037 (HB 07-1037) (2007). April. Retrieved March 12, 2008 from: http://www.state.co.us/gov_dir/leg_dir/olls/sl2007a/sl_253.pdf

Hopper, N., Goldman, C., Schlegel, J. (2006). Energy Efficiency in Western Utility Resource Plans: Impacts on Regional Resource Assessment and Support for WGA Policies. LBNL-58271. August.

Jensen, V.R. (2007) Aligning Utility Incentives with Investment in Energy Efficiency. Prepared for the National Action Plan for Energy Efficiency. Retrieved March 27, 2008 from: www.epa.gov/eeactionplan

Nevada Assembly Bill No. 3 (AB 3) (2005). June 7. Retrieved March 10, 2008, from: http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm

Pacific Gas and Electric Company (PG&E) (2007). "PG&E Energy Efficiency Shareholder Incentive Mechanism: Prepared Testimony," CPUC OIR 06-04-010, May 3.

Southern California Edison (SCE) (2007). "Direct Testimony Supporting SCE's Proposal for an Appropriate Shared Savings Percentage, CPUC OIR 06-04-010, May 3.

Rufo, M., Coito, F. (2002). California's Secret Energy Surplus: The Potential for Energy Efficiency. Prepared for the Energy and Hewlett Foundations, September 23.

Sierra Pacific Power (2007). "Reply Comments of Sierra Pacific Power" Nevada PSC Docket No 07-06046, September 18.

United States Energy Information Administration (EIA) (2006). Form-861: Annual Electric Power Industry Report. Retrieved March 14, 2008 from: http://www.eia.doe.gov/cneaf/electricity/page/eia861.html

Washington Voter Initiative (VI) 937 (2006). Retrieved March 10, 2008 from: http://www.secstate.wa.gov/elections/initiatives/text/i937.pdf

Western Governors' Association Clean and Diversified Energy Advisory Committee (WGA CDEAC) (2007). Clean Energy, a Strong Economy and a Healthy Environment: Western Governors' Association Clean and Diversified Energy Initiative 2005–2007 Progress Report. June 10. Retrieved March 7, 2008 from: http://www.westgov.org/wga/initiatives/cdeac/index.htm

Western Governor's Association (WGA) (2004). WGA Policy Resolution 04-14: Clean and Diversified Energy Initiative for the West. June 22. Retrieved March 8, 2008 from: http://www.westgov.org/wga/initiatives/cdeac/index.htm

Western Governors' Association Clean and Diversified Energy Advisory Committee (WGA CDEAC) (2006). Energy Efficiency Task Force Report. January. Retrieved March 8, 2008 from: http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency.htm

Western Electricity Coordinating Council (WECC) (2005). Hourly Demands 1998-2004. Retrieved March 13, 2008 from: http://www.wecc.biz/modules.php?op=modload&name=Downloads&file=index&req=viewsdownload&sid=149